No. 1668

DESCRIPTION

OF THE

DEFLECTION BOARD

(MODEL OF 1906)

WITH De CARRE DRIFT CHART

FOR 12-INCH MORTAR

MECHANICAL FEATURES,
RULES GOVERNING ITS CARE, OPERATION,
AND PRESERVATION IN SERVICE

(ONE PLATE)

APRIL 4, 1907
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WAR DEPARTMENT,
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WILLIAM CROZIER,
Brigadier General, Chief of Ordnance.

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DESCRIPTION OF THE DEFLECTION BOARD, MODEL OF 1906, WITH DE CARRE DRIFT CHART, FOR 12-INCH MORTAR.

(1 PLATE.)

1. The deflection board, model of 1906, with De Carre drift chart, for 12-inch mortar, consists of a built-up wooden base of cherry, of mahogany finish, called the block, to which is secured a bronze frame, supporting the cylinder, the shield, the De Carre drift chart, main traversing screw, and wheels, shown in the deflection board, assembled. The purpose of the board is to afford a means of determining rapidly the full correction in azimuth to be applied in 12-inch mortar firing. This pamphlet will discuss the mechanical features of the instrument and its operation, care, and preservation. The use of the instrument in conjunction with the other instruments of the mortar fire control and direction system is discussed in publications issued by the Chief of Coast Artillery.

2. The construction of the board depends upon the theory that the angular drift is constant for a given elevation, whatever the velocity. The range table drifts for the several types of projectiles, including 2.95-inch subcaliber, for elevations from 45° to 65°, are plotted on the chart and a change from one type of projectile to the other can be readily made.

3. The final correction given by the board as the result of any assumed prior conditions as to elevation, weight of projectile, etc., is obtained by mechanically setting a pointer at a given place on a graduated scale and then setting a second graduated scale in a given position with reference to the drift chart. The corrected azimuth is then indicated by a second pointer and graduated scale. The pointers are the uncorrected azimuth pointer marked "Set" and the corrected azimuth pointer marked "Read." The scales are the azimuth scale, engraved for whole degrees on the cylinder, and the azimuth subscale for fractional parts of degrees, least reading 5/100, on the frame, and the adjusting scale.

4. The whole degrees of the azimuth scale, engraved on the cylinder, are arranged in 36 rows of figures spaced evenly about the outside of the cylinder as shown. Each row begins with some whole degree number terminating in the number 1, and contains altogether 21 whole degree numbers. An inspection of the cylinder will show this clearly. The reason for engraving the whole degree numbers in this way is that the movements of the various pointer slides must

necessarily be limited, for, if for any reason corrections would involve moving the slides to which the pointers are attached so far either to the right or left as to run them off of their traversing mechanisms, the board would, temporarily at least, be out of commission and further rapid work would be prevented. To overcome any such possibility stops limiting the movement of all slides have been provided. If, therefore, in setting any of the pointers, a stop is encountered, grasp the handle and ratchet ring on the left end of cylinder and move the azimuth scale on cylinder either forward or backward one row of whole degree numbers, depending upon whether the stop has been encountered toward the left extremity or right extremity of movement of any of the slides. For, in moving toward the left, whole numbers on the scale are of decreasing value; hence if a stop is encountered on the left, by moving the cylinder one row forward the next row, 10 whole degrees in value less than the original row, is brought to the reading opening under the guard, and the adjustment of the pointers can again be undertaken by running all to the right of the instrument a distance equal to 10 whole degree spaces. A rapid manipulation of the pointer is provided for in the pitch of the various operating screws, pinions, and racks.

5. It should be noted that the azimuth subscale of fractional parts of degrees, least reading 5/100 degree, is stationary and does not move when the cylinder is revolved. The whole degree numbers on the cylinder are so spaced that as each comes opposite the reading opening under the shield it is situated opposite a whole degree graduation on the fixed part of the azimuth subscale on the frame.

6. The method of moving the cylinder, containing the whole degree numbers of the azimuth scale, has already been described. The other movements of the board affect directly the position of the pointers, and will now be described. Examining the assembled view of the deflection board, there will be seen on the extreme right a handwheel, called the main traversing wheel. This wheel is attached to the right end of the main traversing screw. The main traversing screw is a double screw, of square thread and rapid pitch, passing through the carriage, and traversing the latter right or left. As the carriage supports all pointers of the board, either directly or by attachment, all pointers must move together when the main traversing screw is operated to traverse, and during such movement all pointers will retain their relative positions. In other words, the main traversing screw is operated only to set the uncorrected azimuth pointer marked "Set" at the desired angle on the azimuth scale. The corrections for drift or deflection are not affected by operating the main traversing screw.

7. Directly below the azimuth subscale is the carriage, which affords a seat for the slide. The carriage is moved left or right by

turning the main traversing wheel. The uncorrected azimuth pointer, which is enameled red and marked "Set" in white letters, is attached to the carriage and is provided to enable the instrument to be set to the uncorrected azimuth on the subscale.

8. The slide, upon which is mounted the drift chart mechanism, is moved left or right, independently of the carriage, by rotating the slide knob. Located at each end of this slide are bearings provided for the front and rear rollers. The notches cut in the front boss of the right bearing, form seats for the teeth of the front bearing clutch. The corrected azimuth pointer, which is enameled white and marked "Read" in red letters, is secured to the slide.

9. The drift chart mechanism consists principally of the front and rear rollers, the drift chart and the adjusting scale. The principal parts of the rear roller are the rear rod, chart clamp, knob, knob friction spring, and clamp knob. The rear roller is designed to carry the drift chart, which may be wound up on the rod by turning the rear rod knob. The knob friction spring provides friction to overcome the tension in the spring, which is located inside the front roller and prevents any movement of the chart under the action of the spring. An adjustment is provided for the knob friction spring by means of the nut securing the rear rod knob to the rear rod. The rear rod clamping device is provided for holding the chart against accidental displacement during firing. This device consists principally of the clamp knob, clamp screw, and clamp bushing.

10. The front roller is made up of a hollow tube, inside of which is located a spiral spring, of a chart clamp tube and the front bearing clutch. One end of the spring is attached to the roller and the other to the front bearing clutch, so that an adjustment of the spring tension may be obtained by turning the clutch. A screw in the end of the clutch is provided for holding the clutch teeth engaged. This should be loosened when it is desired to adjust the spring tension. Care should be taken not to allow the front bearing clutch to slip from the fingers after the teeth have been disengaged since this is liable to break the spring.

11. The adjusting scale is secured to the left end of the carriage by two dowel pins and three screws. A slight longitudinal adjustment is provided for this scale to accommodate it to the drift chart if necessary. The scale is graduated 1.50° on either side of the index pointer or normal, which is indicated by the figure "3." The least reading is 5/100 degree, the same as that of the azimuth subscale. This scale corresponds to the lateral drift scale in the battery commander's instrument and is used on the deflection board in making corrections for lateral deviations.

12. The method of operating the various screws, handles, and knobs has now been described in detail. To group movements—

that is, to make drift and deflection correction at the same time—it will not affect the result if either of the corrections is made first or last. In other words, the final answer is not affected if the drift correction is made before the deflection, or vice versa.

13. All exposed metal surfaces of this instrument, except wearing surfaces, are given a sand-blast finish, covered with a coat of transparent lacquer. Graduations, figures, and letters are filled in with black. The parts of the instrument subject to friction, as trunnion bearings, translating screws, etc., should be oiled with clock oil when necessary. Where parts are not readily accessible for oiling, oil holes have been provided. An excess of oil should not be used. Should an oil spot or mark develop on any part of the board having the sand-blast finish, it may be readily wiped off, using a cloth and a little soap and water. The place should be thoroughly dried after cleaning and a thin coat of transparent lacquer applied if the original covering was removed during the operation of cleaning. If no lacquer is available, a thin coat of machine oil, evenly applied, may be used temporarily.

OPERATION OF THE BOARD.

14. Turn the handle and ratchet ring until the proper degree on the cylinder is brought into view, set the uncorrected azimuth pointer marked "Set," to the uncorrected azimuth of the set-forward point by turning the main traversing wheel. Set the drift chart to the normal for the projectile being used, by rotating the rear rod knob, then clamp the rear roller by tightening up on the clamp knob. The correct position is indicated when the fiducial edge of the adjusting scale coincides with the horizontal line on which the type of projectile to be used is marked. Set the normal or index pointer of the adjusting scale to the elevation determined from the range elevation board, by turning the slide knob. The corrected azimuth is then indicated under the corrected-azimuth pointer marked "Read." This pointer then indicates the corrected azimuth of the set forward point for the elevation and type of projectile used.

METHOD OF MAKING CORRECTIONS FROM INSTRUMENTAL OBSERVATION OF FIRE.

15. Corrections may be made for latteral deviation from the instrumental observation of fire as follows: First, note from the battery commander's instrument the point of fall of the splash, that is, the reading of the splash, taken with reference to the target on the lateral deviation scale of the battery commander's instrument. Assume the splash to fall on this scale at 2.75 or .25° right. Note the elevation at which this shot was fired. Loosen the clamp knob, then by means of the rear rod knob, turn the drift chart until the eleva-

tion line, for the elevation at which the shot was fired, coincides with reading 2.75 on the adjusting scale, then again tighten the clamp knob. The drift chart has thus been moved from normal a sufficient amount to correct, at the elevation at which the shot was fired, for the lateral deviation of 25° right, and this correction will be applied in the same ratio as the normal drifts are, for all other elevations between 45° and 65°.

16. When ordering spare parts, use the following nomenclature, etc.:

Name of part.	Piece mark.	Drawing No.
Adjusting scale	4C	22–50–4
Bearing	3F	22–50–3
Block	3D	22–50–3
Carriage	4A	22–50–4
Cap	3E	22–50–3
Cap screw	3G	22–50–3
Cylinder	2A	22–50–2
Cylinder end, left	2G	22–50–2
Cylinder end, right	2E	22–50–2
Chart clamp	5E	22–50–5
Clamp bushing	4G	22–50–4
Clamp knob	4E	22–50–4
Clamp screw	4F	22–50–4
Corrected azimuth pointer	4P	22–50–4
Frame	3A	22–50–3
Front right bearing	5Q	22–50–5
Front left bearing	5L	22–50–5
Front bearing clutch	5R	22–50–5
Front bearing clutch screw	5S	22–50–5
Front inner tube	5K	22–50–5
Handle and ratchet ring	2H	22–50–2
Knob	2Q	22–50–2
Knob stud	2L	22–50–2
Knob friction spring	5D	22–50–5
Main traversing screw	2K	22–50–2
Main traversing screw collar	2W	22–50–2
Main traversing screw washer	2U	22–50–2
Main traversing wheel	2P	22–50–2
Name plate	3C	22–50–3
Plunger	2R	22–50–2
Plunger spring	2S	22–50–2
Rack	3B	22–50–3
Rear rod	5A	22–50–5
Rear rod knob	5B	22–50–5
Rear rod nut	5C	22–50–5
0.123 by 0.312 ($\frac{5}{16}$) round-head screws	2M	22–50–2
0.123 by 0.375 headless screws	2F	22–50–2
0.125 by 0.14 countersunk-head screws	4K	22–50–4
0.123 by 0.25 filister-head screws	2B	22–50–2
0.189 by 0.375 round-head screws	2C	22–50–2
0.06 by 0.12 filister-head screws	5M	22–50–5
0.125 by 0.1 filister-head screws	4B	22–50–4
0.125 by 0.22 filister-head screws	4D	22–50–4
Shield	2N	22–50–2
Slide	4M	22–50–4
Slide knob	4R	22–50–4
Slide pinion	4L	22–50–4

Name of part.	Piece mark.	Drawing No.
Spring	5P	22–50–5
Spring guide	5F	22–50–5
0.093 ($\frac{3}{32}$) by 0.812 ($\frac{13}{16}$) taper pin	2T	22–50–2
0.062 ($\frac{1}{16}$) by 0.5 taper pin	4N	22–50–4
0.093 ($\frac{3}{32}$) by 0.43 taper pin	4S	22–50–4
Uncorrected azimuth pointer	4H	22–50–4
Washer	5N	22–50–5
Washer	5G	22–50–5
Washer	5H	22–50–5

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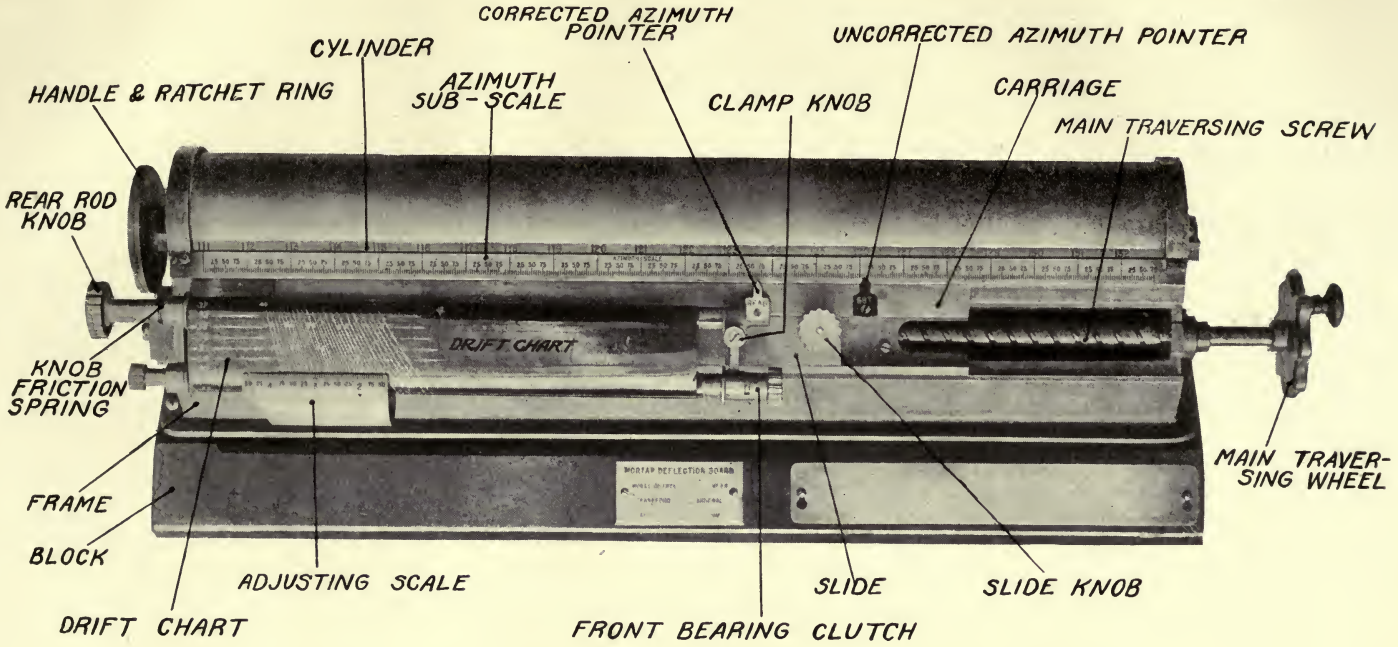

Deflection Board, Model of 1906